Technical Evaluation Report

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ABSTRACT

The 7th Workshop for Exploiting Commercial Games and Technology for Military use took place at The Portal, Qinetiq Farnborough, United Kingdom between May 18th and May 20th 2009. This report draws together the main themes raised at the Workshop. These themes included but were not limited to: Ray-Tracing as an alternative to traditional graphical rendering techniques, Open source versus Proprietary software and applications, level of detail/realism and a discussion on why more Commercial Games companies are not tempted to enter the Military Application arena.

1 INTRODUCTION

This report is not intended to be a simple summation of the eight main presentations plus national updates. Instead it is hoped that it will identify common themes amongst the differing nations, organisations and presenters. It is also hoped that where two or more conflicting view-points exist the reason for the differences, be it cultural, national, or ideological can be identified and perhaps explored in future Workshops.

1.1 Structure of the Workshop

May 18th, Day 1 of the Workshop was set aside for introductions and for attending nations to present their updates from the previous Workshop, along with a presentation from XPI/LM UK on the potential for applications of Ray-Tracing. May 19th, Day 2 contained the bulk of the content of the Workshop, the eight presentations plus an open discussion initiated by Qinetiq's Commercial-Off-The-Shelf Exploitation Unit (COTSEU) Technology Roadmap presentation. May 20th, Day 3 wrapped up the Workshop by holding an open forum discussion on the different Licensing models available to the military for the use of COTS based application, followed by a discussion on the next Workshop (to be held on September 22nd 2009, in Norfolk, Virginia).

1.2 Structure of this report

Section 2 will include a brief summary of the National Updates from Day 1 of the Workshop, but important points and issues raised here will be carried over into Section 4 where the key themes of the eight main presentations will be given (the individual presentations are available on the RTO website, this report is not intended to be a summation of their contents). The report will end with Section 5 which will cover the issues that may need to be addressed in the next and subsequent workshops.

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2   NATIONAL UPDATES

Although this report will not be a simple summation of each of the presentations given during the Workshop, it is worth capturing the progress of each of the nations in a more formal manner.

2.1   Allied Command Transform (ACT) Update

ACT briefed on several programmes of work and study (NNEC and Future Capabilities) as well as:

- **Snow Leopard:** Covered the support for the NATO Training Federation (NTF) using VBS2 and demonstrated at ITEC. Snow Leopard also supports research into Virtual Worlds and supports ADL through a Second Life Island (in conjunction with the Canadians). Also supported by Snow Leopard is the concept of Shared Scenarios, the avoidance of reinventing the wheel that seems so prevalent in the Modelling and Simulation community.

- **INOPEC:** Continues to support the investigation of Modelling and Simulation comprehensive approaches to the non-kinetic areas of this field, including the (disruptive) use of Social Networking (note: the power of Social Networking i.e. Twitter and Youtube to organise protest and disseminate information is currently being displayed in post-election Iran) and the modelling of Human Behaviours. INOPEC also provides the Modelling and Simulation tools for NATO operations with regards to Kinetic Aspects (including Snow Leopard).

This brief generated a short discussion between Wg Cdr E. Roughsedge and Stuart Armstrong, Qinetiq that many potential customers for Modelling and Simulation do not know that they are potential customers. It is a case of they do not know what they do not know. Such an observation resonated with the audience but nobody could offer a succinct solution to the problem (although better education on Modelling and Simulation during early careers will help long term, it does little for the "here-and-now" where senior decision makers have little or no interest in, or understanding of, Modelling and Simulation).

2.2   Norway Update

Svein Martinussen of the Norwegian Defence Research Establishment (FFI) briefed on Norway's progress since the last meeting. Norway's use of, and study of, "Serious Games" spans much of the available market (VBS2, Steel Beasts and OLIVE) but also use of "proper" games and simulations, such as Wonderland, FSX and Battlefield2. The Norwegians have been testing VBS2 for 18 months and it is used by the Norwegian Defence Education Command, Norwegian Army Military Academy as well as the FFI itself. The Norwegians have also made use of a modified version of Unreal Tournament 2004 (UT2004) to produce NORBASE, making use of experienced military staff during the modification process. Finally, Norway hopes to do a side-by-side experiment of both OLIVE and Wonderland.

2.3   UK

Stuart Armstrong from Qinetiq (COTSEU) briefed on UK progress. Highlights of the UK update included:

- VBS2 related applications:
  - Op SOLOMON (VBS2 'lite') to be used by the British Armed Forces as an aid to recruitment
  - Op JCOVE – over 5,000 military personnel have used it for pre-deployment training
  - FRES 2 (validated data used within VBS2)

- Counter-IED: all IED events captured for a six month period and turned into VBS2 Scenarios. COTSEU are working on a 1-day turn around from in-theatre 'event' and the production of the equivalent VBS2 scenario.
- Federated Test Bed: VBS2, ESP, Mosbe, VR-Forces, JSAF – building lots of common terrains. All applications are working together.
- Other work involving Mosbe:
  - 'Friendly Graphical User Interface (GUI)' Investigation
  - Identified as a potential component for Joint Command And Staff Training (JCAST)
- Other applications
  - ESP: UAV Training using PRST – fly a virtual UAV in ESP and then unplug and plug-in real UAV (no re-learning of different hand-held controls – 'Train as you Fight')
  - Merlin Aircrew Tactical Trainer – rolled out to crews on-board ship
  - Coalition MMO Training using OLIVE
  - Maritime Immersive Learning Simulation (used for pre-deployment familiarisation)

The mention of ESP initiated a debate started by Wg Cdr Roughsedge who noted the seeming differences between the big primes in the 'normal' military fields and those in the 'gaming' and 'entertainment' industries. In modelling and simulation it is the small companies, such as BIStudio (VBS2) that can react to changing market conditions, whereas the big companies, such as Microsoft (ESP), unexpectedly, despite the agreement with the MOD, killed off ESP to focus on core business. A year ago, there were some within DEC JTES who believed that once Microsoft had settled on the "Serious Game" side of Modelling and Simulation it was only a matter of time before they used their weight to swallow up BIA (as it was then) and VBS2.

The Wg Cdr also raised another interesting point that featured in Days 2 and 3 of the Workshop, that of the products produced by the Open Source community, specifically that of Falcon, which the Wg Cdr described as a 'revelation'.

As VBS2 featured so heavily in Stuart's brief several attendees of the Workshop asked why the gaming community with their foray into "Serious Games" had not produced a Logistics Modelling based application. Peter Morrison of BIStudio asked a very straightforward question: "Who is defining the requirement so that gaming products can be tailored/sourced to meet the requirements?" Wg Cdr Roughsedge offered a simply reply – that there are no requirements because the Logistics community lacks the in-house skill set to define those requirements. Nobody at the Workshop could offer any additional thoughts that could end this impasse.

Another issue was raised during this brief that also featured in discussions during day two and day three of the Workshop. Using Google Earth (and the like) it is now possible to extract a basic and potentially reasonable resolution image of anywhere in the world, so why aren't there any "Whole World" terrains? Peter Morrison offered a succinct reply – Teens don't want "Whole World" terrains – they don't want dull parts of dusty Kenya. If the Military want something that is not appealing to the Game Industry's Core Market (which is where they make their profit) then they will have to invest directly in the game company for it to happen.

2.4 France

Jerome Martinet from the French Battle Lab (LTO) briefed the French progress in the use of COTS applications. Again, VBS2 featured heavily and once again, an interesting aspect of Licensing was raised (i.e. the legitimacy of 'Operation 'French' Point').

Phoenix 2007, an urban environment generator with a man-machine interface used the GOTS Sensurprys application, using Kynapse for animation and AI. While Sensurprys is an excellent application it is not easy to tailor for experimentation because of its complexity. For this reason for Phoenix 2008 the switch to a full COTS product, VBS2 was made. VBS2 was used to make detailed 3D terrains and scenarios were produced that allowed for iterative improvements. The AAR function was used to replay and understand why decisions and had been made and, for the benefit of the Workshop audience, produce a video highlighting the effects of non-Line-of-Sight weapon firing.

LTO is also experimenting with a plug-in for the iPhone which uses a webpage displaying movement buttons that allows VBS2 entities via a php server to be controlled via an ad-hoc Wi-Fi connection. It was not stated if this has yet found any practical purposes other than as a 'proof of concept'.

LTO are also investigating VBSKynapse, an alternative AI for VBS2 that will allow them to reuse their Kynapse work from Sensurprys. [It is noted by many military and civilian students who encounter VBS2 at the Defence Academy of the UK (DA-UK) that civilians are fairly 'dumb' – reacting unrealistically to being shot at (but not actually shot), bomb-blasts and explosions, etc. Teaching staff at the DA-UK continually point out that VBS2 is derived from ArmA and that the realism of 'white' AI is not high up on the list of priorities of the average online First Person Shooter (FPS) gamer.]

During the brief Jerome identified that prior to VBS2 they had been using standard games in experimentation using only the games own modification tools. To this end, they had modified Operation Flashpoint (Op FP) to produce Operation 'French' Point. This is where the issue of Licensing was raised again. As a commercial game, using Op FP in this way breaks the T&Cs of the game's licensing agreement. Peter Morrison (BIStudio) is aware of Op 'French' Point and is trying to persuade the organisation to switch the capability over to VBS2.

3   REAL-TIME RAY TRACING

Day one ended with a presentation and demo by Simon Skinner of XPI Simulation Limited, supported by Colin Stroud of Lockheed Martin UK (LMUK). The presentation discussed Synthetic Natural Environment Ray Tracing (SNERT) work that is funded by DTIC, DEC JTES in the UK. The work is trying to answer what appears to be a straightforward question: Can ray-tracing be made real-time?

SNERT appears to offer lots of potential benefits: visual and sensor images can be derived from the same scene data, it scales well for high poly count scenes and models and it is ideal for producing the increasingly requested "multi-spectral" imagery. With the polygon-count limitation lifted it would be possible to have procedurally generated scenery; trees, bushes, etc. (and these trees could have "real" attributes, such as chlorophyll content, which is important for camouflage detection using multi-spectral sensors).

Two approaches are available in hardware for the massive amount of parallelisation required before ray-tracing becomes genuinely real-time:

- Intel: use high number of cores (64) in a specialised CPU, the Larrabee, an x86 based CPU
- Nvidia: Tesla and Quadroplex – Hundreds/Thousands of much simpler cores, slight modification to the architecture found in the latest generation of gaming graphic cards.

Several programming languages and techniques are available to develop ray-tracing applications on these systems. From the Open Source community there is OpenRT (Yacort) and Manta. Alternatively, there is the proprietary approach of using Nvidia's CUDA (Compute Unified Device Architecture) and NVIRT which allows a Hybrid visualisation of classic Rasterisation approach (which Nvidia has, like AMD/ATi

invested in massively) with the emerging capability of Ray-Tracing for specific things within the scene (liquids, shiny objects etc).

The XPI/LMUK demo is programmed in CUDA and runs on two Nvidia GX280 graphic cards at a relatively low resolution (1024x768). The small geo-typical Middle-Eastern village runs at between two and ten hertz and while the shadowing, lighting and reflections are initially impressive, it is clear that this is "early days" and the visuals could be considered rather simplistic. Certainly, compared to Qinetiq's Quadroplex box which was running VBS2 spanning three (and can support four) 1600x1200 screens at screen refresh rates (c. 60Hz) using traditional rasterisation techniques it will be difficult to persuade the military customer and impossible for the gaming community to take a visual "step backwards" while ray-tracing techniques and technology matures sufficiently.

The future for real-time ray-tracing will be perhaps for highly complicated 3D models consisting of, perhaps, millions of polygons combined with the need for fast (i.e. real-time) radar signatures (after all radar is just one additional part of the EM Spectrum). Ray-Tracing could also improve the path-finding through complex terrains of AI controlled objects and entities.

It is likely that NVIRT offers the greatest immediate hope for Ray-Tracing, it keeps all of the visual detail (be it real or 'faked') that years of specialisation of hardware to deliver ever faster rasterisation, while allowing for all of the benefits of ray-tracing where it is either desired or required.

4 COMMON KEY THEMES COVERED BY DAY TWO PRESENTATIONS

While all eight of the presentations given on day two were from diverse sources it was clear that there were many commonalities. The key common themes covered by most if not all the presentations are given in the rest of this section.

4.1 Why aren't more "Games" companies interested in creating defence related products?

This question was asked, in several different forms, of and by the only two representatives of gaming companies in attendance at the Workshop, namely Breakaway Games (MOSBE) and BIStudio (VBS2). The fact that there were only two gaming companies in attendance is in itself indicative of the lack of interest in the military market by the gaming/entertainment industry.

The rather simple but concise answer is – money, a general inability for a games company to make enough profit to justify the investment. In the gaming/entertainment world an AAA game (a turn often used to describe a product with a big budget and/or expected to sell one million titles) the game producer can expect for a return of five-fold on their investment (so a $40M investment in a game generates $200M in sales). In a military/defence contract the same game producer will be contractually and legally limited to a profit of 10-20% of the value of the contract. (These figures are supported by a hypothetical games company presented by Peter Morrison)

Games companies also seem to exist in a strange no-mans-land between being thought of as too cheap to be of serious value or too expensive because "they're only games". For example, at the time of writing, a single seat license for the World Builder application of MOSBE is $50,000 plus $5,000 for the Scenario Builder and $200 per seat for the Viewer - so a World Builder, Scenario Builder and ten player stations would cost $57,000 dollars. This is not, from some perspectives, a small amount of money for something perceived by some to be "just a game". However, spending less than $60,000 dollars on an application that can be used as an entity level constructive simulation for Command Staff that can handle in excess of 2,500 entities (Battle Group sized encounters), with realistic (in appearance) intel from UAV assets

producing SAR, IR and multi-spectral imagery, compared to the price a large 'Prime' would charge (if they would supply such an application at all), the cost suddenly seems quite small. Breakaway also noted (on Day three during the Licensing discussion) that they had been offered $3M by one organisation to purchase Mosbe 'as is' rather than spending just the $125,000 required to purchase the licenses necessary for their needs. Is this simply an old fashioned attitude to a new way of doing business with a new type of defence contractor?

Finally, and this will be covered again in both the section on Open Source vs Proprietary and that of Licensing is the sudden change in costs when a COTS application changes from research and experimentation to a full blown military requirement. Valve were happy for Qinetiq's DIVE-II to be based on the COTS game Unreal Tournament 2 for no cost but for Qinetiq to license the UT2 'engine' so DIVE-II could be a stand-alone package, Valve wanted $1M, for just the game engine – no content – just the game engine. This is simply because that is what the game engine was worth to Valve, it is the single thing that makes their game in the entertainment field stand-out from the rest and therefore it is/was a valuable commodity.

4.2   Validation and Verification of applications based on COTS products

Something closely related to cost that is often used to deride COTS based applications, is that of their levels of Validation and Verification (V & V). The issue of V&V was raised in the very first presentation of the day given by Jen McNamara of Breakaway Games when she was queried over the validity of the data used to power "A force more powerful" (AFMP), a turn based strategy 'game'. It was acknowledged that the V&V of AFMP was unorthodox, but by recreating twenty historical conflicts in AFMP and letting them 'play out' it was shown that the application produced realistic and credible end-game results. It was suggested by Breakaway that V&V be sub-divided into mini-V&Vs performed by each lab that takes a Breakaway product, so that the level of confidence is built up over time. MOSBE itself offers what Breakaway calls "Jane's" Level of Detail and includes a rather simple kill model for vehicles (vehicles are either alive or killed, there are no mobility or firepower kills).

The presentation by Afzal Ali on the use of VBS2 during the FRES2 study in NITEworks continued the V&V debate. The V&V of VBS2 was continually called into question and yet it was generally accepted that such V&V issues can be managed. Peter Morrison asked who pays for the V&V that the military thinks it needs for COTS applications, since "looks right" and "good enough" is acceptable for the gaming market (who in the end are paying for the application's development via sales). Peter also pointed out that it is often easier to use real data/algorithms/mathematics if they're available to generate an effect rather than take artistic license and 'make it up'. V&V for VBS2 for the FRES2 experimentation was done by using military subject matter experts (SME) acting as scrutineers and deemed 'fit for purpose' (i.e. can that tank really designate a target with its laser at this particular range?).

Is this the difference between good enough for training purposes, i.e. plausibility; does the missile fly-out look right? Does it matter that MOSBE currently has only K-kills for its vehicles? Compared with the V&V required for Analysis purposes i.e. millisecond level timing of the precise course flown, using actual tracking algorithms, by a missile on an intercept course with an aircraft.

4.3   Open Source versus Proprietary Applications

The issue of Open Source versus Proprietary Applications raised its head on Day One of the Workshop when XPI mentioned, briefly, during their ray-tracing presentation that new ray-tracing architectures could be programmed via proprietary software such as NVIRT or by Open Source Applications such as OpenRT. Also on Day One during the UK update brief Wg Cdr Roughsedge discussed the (apparent) quality and attention to detail of the Falcon flight simulator. During Perry McDowell's presentation "Game Engines: Not just for gaming anymore", which discussed Battle Damage Assessment on behalf of

MOVES (Modelling Virtual Environments and Simulation), but also mentioned Delta-3D which is the DoD supported Open Source gaming engine which has been recently upgraded to include many of the features found in proprietary game engines, such as HDR (High Dynamic Range) Lighting and is the backbone for the Battle Damage Assessment application.

During the discussion on Day Three about Licensing the topic of Open Source and Proprietary applications came to the fore after Perry gave a long presentation on the benefits of Open Source, although this did not really get to the crux of the matter other than to stimulate the debate on the subject. It was Peter Morrison who noted that for his company Open Source (and therefore the loss of IP) would be committing financial suicide. A straightforward question was posed to the audience, that was not fully answered – how does a commercial company make a profit (in the here and now) if it spends money upfront developing a product which can be sold, but must be put into a format that will allow others to produce additional value added products based on this work and make potentially more profit for a fraction of the initial investment? Although Peter did note that even Bohemia Interactive (original developers of Operation Flashpoint) has benefitted from Open Source applications as Operation Flashpoint used ODE, an Open Source physics engine.

Irrespective of the debate in the gaming/COTS area about Open Source and Proprietary applications there is one definitive item of note – the MOD is inherently distrustful of Open Source. MOD, put simplistically, is a culture of secrecy and proprietary software, which is effectively a 'black box', the contents of which are kept secret from the user, suits this culture. Whereas, the thought of understanding/seeing exactly how the source code is built in an Open Source application immediately raises the spectre of 'security'. The Open Source community's argument of "many eyes a bug does squash" does not sit comfortably in the minds of those in defence.

4.4   Value and ease of user added/created content

One of the great benefits of VBS2 and MOSBE is the ability of the end-user, depending on their skill level, to add content to the basic set provided with the application, be it new scenarios, terrains or behaviours. While taking a slightly different approach to this concept the presentation by Graham Duncan of Caspian Learning and Simon Coulson of DCTS (User Generated Serious Games Case Study) studied this aspect in great detail.

Graham and Simon offered an alternative approach from the traditional method of application construction and user content creation. Thinking Worlds is a web-browser based application designed, initially, to meet educational needs (e-Learning) and has found it has much to offer to the training of military personnel. A selling point for Thinking Worlds is that it allows for training in smaller 'bite-sized' chunks, where the user feels they have ownership of the product and, equally importantly, the training, and can do this training wherever they have access to a suitable PC. This is, in concept, not that dissimilar from *A Force More Powerful* (AFMP) as it was designed with a very good manual and game-like GUI because, of the displaced nature of its use, there was no opportunity for Breakaway to provide support for the application. Another trait Thinking Worlds and AFMP seem to share is the concept that the trainer and/or the user have control over what they perceive/need the training outcome and objectives need to be, be it the layout of a ship in Thinking Worlds, or the over-throw of a dictatorship in AFMP.

The Caspian Learning presentation also raised another important issue related to the small defence market. While in browser-based applications Shockwave is DII (MOD classified Network) capable Flash is not. Also, in many ways, for the environment created by Thinking Worlds, Shockwave is 'better' than Flash (multiplayer, 3D, physics). However, Adobe sees the military/serious games market as inconsequential compared to their normal everyday (Flash-using) casual user. Therefore it is the military market which must adapt and learn to use what it can from the mainstream (entertainment) market, because products such as Shockwave will not, and have not, been updated just because the defence market would like them to be.

In many ways this is no different from users of VBS2 downloading Armed Assault (ArmA) assets (Vehicles and Terrains) from the gaming community (often at zero cost) and using 'as is'. This is not practical if V&V is required of this asset but this simply returns us to, and enforces, the 'fit-for-purpose' argument from earlier: Training (looks/feels right) over critical analysis (are the armour/max speed/weapon characteristics exactly right.

4.5   Realism

Starting with the XPI ray-tracing presentation on Day One the question was raised as to just what is "realistic"? And possibly more importantly, just how much realism is needed to satisfy the end-user? The drive for real-time ray-tracing is, fundamentally, to generate more realistic looking representations of the real world, be it reflections, shadows, lighting, atmospherics or particulates using 'real' physics, without many of the 'cheats' required by the rasterisation-based techniques. However, as discussed earlier, 'fit-for-purpose' should be the main driver for visual realism. It was noted by Breakaway games that in strategy based games, which invariably do not have exciting 3D graphics, an engrossing, realistic feeling scenario can and does lead to players sweating and shouting over the outcomes of their decisions. Game play, in the literal sense, is often more important. In fact it was noted by Breakaway that once a game/application becomes very realistic looking the slightest thing which is wrong is sufficient to destroy the immersion, whereas a lesser looking application if game play is engrossing will get away with more.

A good example of this is in fact VBS2. While VBS2 produces realistic shadows for astronomical bodies (sun and moon) which aid the immersion and increase the level of realism, at night, in-game lighting does not generate any shadows. This can be quite off-putting for the player once they become aware of it, whereas the original Dismounted Infantry Virtual Environment (DIVE) from Qinetiq which used the original Unreal Tournament engine produces no shadowing of any description and yet was fully engrossing despite the relative simplicity of the graphics, especially compared to current offerings.

It was also noted at the Workshop that on occasion too much realism can often destroy or make it difficult to focus on the precise training outcomes for a particular task. Training often needs to be a subset of the real world equivalent so that training has real benefit, but too much realism can often lead to the same cognitive overload that makes it difficult to train for a particular task or function in the real-world. Again, this can be summarised as the 'fitness-for-purpose' theme that ran through most of the discussions at the Workshop.

Of course, some improvements in the realism of visuals are beneficial to training tasks to avoid negative training. Both XPI's ray-tracing presentation (realistic lighting calculations) and Perry McDowell (inclusion of HDR in Delta3D gaming engine) highlighted that in the asymmetric battle, where the enemy may be literally hiding in the shadows within the urban environment, correctly rendered scenes where the OPFOR is actually difficult to identify (and therefore engage) is necessary, if this is part of the training that the application is intended to provide.

Increased realism in training, in particular that of the OPFOR, was covered, with particular emphasis on Insurgency and C-IED by two presentations, the first by Peter Morrison of BIStudio (Insurgent Mindset Training in VBS2) and the other by AOS (Autonomous Decision-Making Software – Populating VBS2 with realistic virtual actors).

The presentation by BIStudio identified that VBS2 is a highly adaptable tool in the hands of the imaginative. The end state for this training is to have soldiers who are better able to detect and therefore deter potential insurgent activity. During the training process the US Marines participate in eleven scenarios where they play the insurgent force trying to place an IED to destroy an AI controlled BLUEFOR. Having mastered the role of insurgent, the Marines then play as BLUEFOR, adopting mechanisms and applying the lessons learned that make it very difficult for OPFOR to place IEDs.

A video played to support this presentation showed a player as an insurgent placing an IED which, later in the video, destroyed a BLUEFOR convoy. It was noted that the IED carried by the player was 'unrealistically' floating in front of the player. However, this was a conscience decision and request by the USMC. The carrying/displaying of the IED was not the main training aim and therefore, it was not necessary to be realistic in the truest sense and have the IED hidden (both from BLUEFOR and the player). The training benefit was derived from "getting into the mindset of the insurgent", i.e. the placement of the IED in the optimum place to cause maximum damage and choosing the best location from which to observe and trigger the IED (and invariably escape).

The AOS presentation discussed a closely related matter both in terms of realism and that of insurgency behaviour, i.e. the applications Artificial Intelligence (AI). It has been noted elsewhere that exposure to VBS2 in the domain of education has lead to criticism of the in-built AI for the control/behaviour of civilian clutter. Much of this can be overcome by careful scripting, but careful scripting may require a level of skill not possessed by the end user or require time that is not available to fine-tune. The AOS solution is to offer CoJACK to control the behaviour of particular AI assets (i.e. suicide bombers). CoJACK offers an alternative to standard 'dumb' AI or lengthy scripting, by controlling the virtual actors using a BDI (Belief, Desires, Intentions) methodology. Like the LTO's control of VBS2 entities via web-based controls on an iPhone, CoJACK interfaces to VBS2 via the Application Scripting Interface (ASI) this time enhancing the control of the AI. CoJACK is designed to update behaviour on discrete VBS2 events, this is in fact the screen refresh rate plus additional in-game triggers.

The integration of CoJACK into VBS2 has some issues: VBS2 will, on occasion, use its own AI to take control of the virtual actor and can sometimes be unresponsive to CoJACK commands. Despite issues with its own internal AI, BIStudios has no wish to replace the current AI with only one alternative, it would prefer to work in partnership with as many industry (and Open Source?) AI builders as possible so that the end user of VBS2 can pick and chose additional AIs as they are required, rather than force a particular option upon them.

4.6 The future of COTS in the military domain

At some point in the relatively near future decision makers within the military will not be of the mind-set "if you're not getting wet, it's not training" or "we never needed computers when I was younger". Also, it can be assumed that new recruits will be familiar with PC based applications, virtual worlds, social networking, indeed they may very well expect the military to be in advance of what they have access to in their previous civilian lives. Will they be disappointed? Are we ready for the culture shift when it arrives?

Matt Spruill from SAIC (presentation: 'SAIC's foray into virtual worlds') raised some interesting points to end Day Two of the Workshop. Should we be focussing on the "sixth graders" (11-year olds) of today and trying to understand how they learn and with what, because given military project lead times, these sixth-graders are the eighteen year old recruits of our immediate future. Are we being "outside the box" enough to cope with a generation (the first generation) that has (theoretically) always had access to a PC and the Internet. Indeed, referring back to the very beginning of this report, this enlightenment may have already started as can be seen from the days immediately after the disputed Iranian Election 2009. It is worth noting that half of Iran's population is under the age of 25 and despite Government Firewalls blocking access to BBC Persia and other Western media services, the use of mobile phones, Twitter, Youtube, anti-filtering techniques and email guaranteed that evidence of the upheaval within Iran was getting out to the rest of the world. The disruptive force of Social Networking has never been so abundantly clear. So what will a generation who haven't just adopted and embraced such technology, but have grown up knowing nothing else be capable of in a few years time?

SAIC presented a test case for training for IEDs at the staff level. A group of 12 split randomly into those using traditional powerpoint techniques and those placed in a virtual world (US Nexus). In a pre-training

test the group that would undergo traditional training scored 20% higher marks. Post training tests indicated that the group undertaking the training in the virtual world scored 20% higher marks. While the validity of the test was questioned during the brief, what is important to note is that training within a virtual world is now not only possible, but is an acceptable alternative. In the future it may be more than acceptable, it may be expected or necessary. Given the ever increasing constraints on budgets and the ability of natural resources to support travel and or training, virtual worlds may offer one of the few opportunities for collaborative meetings, training and exercises.

Stuart Armstrong's Qinetiq Technology Roadmap for the future up to 2020 was fascinating, especially when you consider the technology roadmap for Intel extends only three years into the future and for Nvidia only nine months. Concepts such as 'cloud computing' will in the fullness of time be seen as either foolishly optimistic or foolishly short-sighted.

The UK Government's recent announcement that everybody in the UK should have access to a minimum of 2Mbit/s Internet access, shows a very narrow view of the future of Internet usage. 2Mbit/s is sufficient to stream standard definition television content. However, this will not cope with HD-TV, nor will it allow for serious levels of upload rates as the minimum bandwidth for upload does not appear to be defined within the "Digital Britain" document, so the dream of some, to rely totally on the likes of Google docs to store their digital lives might not come to fruition in the foreseeable future. The Digital Britain report does come up with one particularly interesting number – that one-third of the World's population (2 Billion people) currently have some access to the Internet.

5   THOUGHTS FOR NEXT MSG-078 MEETING

A discussion on what should be considered for the meeting in Norfolk, VA on September 22nd 2009 ended Day Three and the Workshop. Attendees would like to see the following areas discussed or considered for discussion at this meeting.

- Procurement strategies related to COTS products of other member nations (best practice?)
    - To also cover licensing strategies (if any)
- More Demonstrations
    - Possibly informal during an evening reception
- More Games Companies in attendance
    - Given the geographical location of the next meeting this more likely but:
    - Games companies are not interested in supporting, or offering military applications, Kudos is not enough, it's about potential profit
- More on Algorithms
    - For example a follow-up on the progress of the Ray-Tracing presentation given at this workshop
- Given that only a limited number of Europeans will be in attendance because of the location consider streaming Demonstrations and Presentations for the Workshop back to the UK (for example to The Boeing/Qinetiq Portal):
    - Use it as a 'proof of concept'
    - Walk-the-walk, as well as 'talk-the-talk'
    - Start working on security issues and time differentials now, so that it runs smoothly on the day

- Sell it to superiors and get them involved and/or in attendance
  - Perhaps run an 'Exercise' of some description as part of this link
- Data rights
  - Standards and Data formats
- Middleware Plug-ins
  - Such as AI plug-ins for VBS2
- Successful Case Studies!
  - "Solutions not problems" such as the success of the USMC C-IED programme in VBS2
  - Show Leadership the successes increases chance of future buy-in
  - Representative from USMC to talk about this programme
- Re-use and Interoperability
- Human Factor based Experimentation
- More Academia involvement
  - Students, a rich source of experimenters and guinea pigs!
- How to "advertise" these events – more of the right people in attendance
- Interaction between applications
  - Is there a viable COTS alternative to DIS and/or HLA?
- More Games for non-kinetic domains
- If money was available:
  - The creation of a scenario for MSG-078
  - Ship to European participants not in attendance
  - Participate in demonstration
- Virtual Reality
  - Is there anything beyond Second Life?
- "mash-ups"
  - Moving beyond "one size fits all"

It is a long list and should simply be considered a wish list of the attendees. However, it should be taken as a good sign that interest in this area is not waning despite the belief from some that no actual advancements are achieved and attitudes from the decision makers do not change.

6   SUMMARY AND CONCLUSIONS

VBS2 was undoubtedly the single biggest focus of this workshop, featuring in some way in almost every presentation or discussion which followed. In many ways it remains the pinnacle of success for the implementation and adoption of COTS based technology into the defence arena. However, this was purely down to luck, the adoption both by the USMC and UK MOD was not done through careful selection, but simply by BIStudios being in the right place at the right time.

Are there other products and applications out there that would be ideal for adoption/conversion to military use that have simply not been lucky? Even if such products exist is there the mechanism available or the stomach to make such procurement, as that undertaken to obtain the VBS2 Gold License?

Will there ever be a time where high level decision makers expect COTS applications to be considered on an equal footing with the 'big primes'? Although the investment in ESP by the UK MOD, which seemed like a forward looking plan and a 'safe bet' may have given some of those decision-makers reason to sustain their doubts over the COTS market.

Licensing of COTS products will continue to be a topic of discussion and it will be interesting to see how the pricing of MOSBE (especially for the World Builder) affects take-up (within the UK MOD). Given the interest in the product by NITEworks and Cranfield University (in the UK) the results in the study of MOSBE by Dstl will prove to be interesting.

Intermixed with the discussion over licensing costs is the continuing issue over proprietary over open source. While open source has its merits (cost not necessarily being one of them – given the potential cost of support) it is likely that, in the military context, certainly in the UK, that the feeling of security (real or false) that proprietary software offers means that open source is unlikely to be readily adopted in the foreseeable future. Such a predication, of course, is subject to future budgetary constraints.

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